Water Pipe Sizing by Velocity (Feedwater, Condensate)

Inside diameter of a feedwater, condensate or cooling water pipe for a mass flow and design velocity, with water density from IAPWS-IF97.

Method: IAPWS R7-97(2012) IF97 (density); Continuity equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Water flow	51,000	kg/h
Water pressure (absolute)	90.000	bar
Water temperature	105.00	°C
Design velocity From your piping specification; the calculator does not suggest one.	2.5000	m/s
Chosen pipe inside diameter to check (0 = skip)	77.900	mm

Calculated results

Parameter	Value	Unit
Inside diameter for the design velocity	86.744	mm
Velocity in the chosen pipe	3.0998	m/s
Volume flow	53.187	m³/h
Water density	958.88	kg/m³

Formula and method

$$Q = \frac{\dot{m}}{\rho} \qquad D = \sqrt{\frac{4\,Q}{\pi\,u}} \qquad u_{sel} = \frac{4\,Q}{\pi\,D_{sel}^{2}}$$

Variables

$\dot{m}$	water flow	kg/s
p	water pressure, absolute	Pa
T	water temperature	K
u	design velocity	m/s
D_{sel}	chosen pipe inside diameter	m
D	inside diameter for the design velocity	m
u_{sel}	velocity in the chosen pipe	m/s
Q	volume flow	m³/s
ρ	water density	kg/m³

Method and standards

Continuity for a full circular pipe with the liquid density from FireCAD's IAPWS-IF97 implementation.

Assumptions and limits

- The water must be liquid below its saturation temperature at the pressure entered. Flashing condensate is two-phase and is not covered. At exactly saturation the IF97 phase test may treat the state as vapour and reject it: enter a pressure slightly above the saturation pressure for saturated condensate.
- Liquid water only (the pressure must be above the saturation pressure).
- Sizing by velocity; check the pressure drop and, for pump suction lines, NPSH.

References

• IAPWS R7-97(2012) IF97 (density)

- Continuity equation

Report details

Report reference	FCC-N3S5-AYXZ (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Water Pipe Sizing by Velocity (Feedwater, Condensate)
Method last reviewed	10 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/piping/water-pipe-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.